



February 8, 2019

Email and Certified Mail

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Re: Berkeley Pit and Discharge Pilot Project Work Plan

Dear Mr. Greene and Mr. Reed:

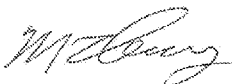
Montana Resources, LLP (MR) and Atlantic Richfield Company (Atlantic Richfield), jointly as the Settling Defendants (SDs) for the Butte Mine Flooding Operable Unit (BMFOU), are submitting the *Draft Berkeley Pit and Discharge Pilot Project Work Plan* (Discharge Pilot Project Work Plan) to the United States Environmental Protection Agency and Montana Department of Environmental Quality (Agencies) for review and approval.

In order to expedite the review process with the Agencies, portions of this work plan have been previously submitted including Appendix A, Onsite Water Management Work (by MR) and Appendix B.1, Pilot Plant Work Plan (by Atlantic Richfield). The following items are the anticipated future submittals:

- Discharge System pipeline designs,
- Evaluation of impacts to downstream operable units,
- Data quality objectives table,
- Operations assurance plan,
- Commissioning plan, and
- Demonstration plan.

Please contact us with any questions or would like to set up a meeting to review.

On behalf of the Settling Defendants,



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Attachments:
Draft Discharge Pilot Project Work Plan

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE MINE FLOODING OPERABLE UNIT**

Draft

***Berkeley Pit and Discharge Pilot Project
Work Plan***

***Montana Resources, LLP
and
Atlantic Richfield Company***

February 2019

SILVER BOW CREEK/BUTTE AREA NPL SITE BUTTE MINE FLOODING OPERABLE UNIT

Draft

Berkeley Pit and Discharge Pilot Project Work Plan

Prepared by:

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February 2019

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Attachment B Discharge System Work Plan and Pipelines Design
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Attachment B.2 Discharge System Pipelines Designs – PENDING SUBMITTAL NOT INCLUDED WITH THIS DRAFT
Attachment C Evaluation of Impacts to Downstream Operable Units – PENDING SUBMITTAL NOT INCLUDED WITH THIS DRAFT
Attachment D Data Quality Objectives Table – PENDING SUBMITTAL NOT INCLUDED WITH THIS DRAFT

REVISION SUMMARY

Revision No.	Version	Description	Date
Rev 0	Draft	Draft Issued for Agency Review	2/7/19

1.0 INTRODUCTION

Montana Resources, LLP (MR) and Atlantic Richfield Company (Atlantic Richfield), jointly as the Settling Defendants (SDs) for the Butte Mine Flooding Operable Unit (BMFOU), are conducting the Berkeley Pit and Discharge Pilot Project (Discharge Pilot Project) work as outlined in this Work Plan. Conceptual approval for the Discharge Pilot Project was requested by a letter dated January 25, 2019, and received in a letter dated February 27, 2018. The Discharge Pilot Project is being completed under conceptual approval from the U.S. Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (DEQ) (Agencies). The Discharge Pilot Project is a temporary, multi-year pilot project that seeks to evaluate a system to control the rise of water levels in the Berkeley Pit and East Camp points of compliance (POCs) and to test additional methods of treating water from Horseshoe Bend (HsB) Seeps, Berkeley Pit water, and other sources of on-site water to discharge treated water that meets all required water quality standards to Silver Bow Creek. Information developed during the Discharge Pilot Project will be used to evaluate potential improvements that may be necessary to implement the final BMFOU remedy.

The Discharge Pilot Project will incorporate the work from the following major supporting work plans:

1. **On-site Water Management:** Water management practices and flows on the active mine site will be reconfigured to support the objectives associated with the Discharge Pilot Project and facilitate the off-site discharge of treated water. The on-site water management details are included in Attachment A.
2. **Off-site Discharge of Treated Water:** Activities to design, build, and operate a polishing treatment system to treat water will meet BMFOU *Consent Decree* (CD) (EPA, 2002) standards for off-site discharge to Silver Bow Creek. Details on the discharge of treated water are included in Attachment B.

1.1 Discharge Pilot Project Background

The BMFOU *Record of Decision* (ROD) (EPA, 1994) states that treatment facilities capable of meeting relevant surface water discharge criteria must be constructed, tested, and ready to operate before groundwater levels at any POC reach the critical water level (CWL) of 5,410 feet above mean sea level (amsl). This Discharge Pilot Project is designed to provide information on the first and second remedial action objectives (RAOs) as stated in the BMFOU ROD and aid in design of the final remedy:

1. *“Ensuring that the CWLs (i.e., the safe water levels) for the Pit system and the West Camp System are not exceeded so that contaminated mine water is contained and does not discharge to the alluvial aquifer or Silver Bow Creek.*
2. *Ensuring that treated water discharged to the Silver Bow Creek drainage meets State of Montana and other pertinent water quality standards.”*

Consistent with the requirements of the BMFOU CD (EPA, 2002), the SDs are currently conducting a Remedial Action Adequacy Review (RAAR). The Discharge Pilot Project will be conducted in parallel with the RAAR. The SDs anticipate that findings from the RAAR and the Discharge Pilot Project will both be used to support and supplement the final BMFOU remedy.

Relevant correspondence between the SDs and the Agencies pertaining to the Discharge Pilot Project include the following:

- Correspondence (SDs, January 25, 2018). The SDs submitted a letter to the Agencies for approval of the proposed conceptual design for the Discharge Pilot Project.
- Correspondence (EPA/DEQ, February 27, 2018). Received Agencies' approval with comments for the Discharge Pilot Project conceptual design.
- Correspondence (SDs, August 2, 2018). The SDs submitted a letter to the Agencies requesting clarification of comments received on February 27, 2018.
- Correspondence (EPA/DEQ, August 24, 2018). Received Agencies' clarification to the comments provided on February 27, 2018. The letter also provided additional clarification on the Discharge Pilot Project shakedown period, water quality discharge standards, and use of flow augmentation.
- Correspondence (Atlantic Richfield [on behalf of the SDs], September 24, 2018). Atlantic Richfield submitted the Draft Discharge System Work Plan (Attachment B.1) to the Agencies.
- Correspondence (EPA/DEQ, December 17, 2018). Received Agencies' comments on the Discharge System Work Plan.
- Correspondence (MR [on behalf of the SDs], January 16, 2019). MR submitted the On-Site Water Management Work Plan (Attachment A) to the Agencies.

1.2 Outstanding Issues Identified in the 2011 Five-Year Review

The Discharge Pilot Project provides an opportunity to evaluate several issues (listed below) and recommendations identified in the 2011 Five-Year Review (CDM, 2011) (2011 Five-Year Review):

- Issue No. 2: Additional performance testing to evaluate supersaturation of gypsum and scaling in the polishing plant and effluent to Silver Bow Creek.
- Issue No. 3: Evaluate polishing treatment as a way to ensure reliable cadmium compliance.
- Issue No. 4: Additional performance testing to evaluate treating Berkeley Pit water.
- Issue No. 6: Perform Whole Effluent Toxicity (WET) testing on effluent representative of current influent water quality and operating conditions.

The SDs will address these issues and recommendations during the Discharge Pilot Project.

1.3 Evaluation of Impacts to Downstream Operable Units

Atlantic Richfield, on behalf of the SDs, evaluated the impacts to downstream Operable Units (OUs). The evaluation is included as Attachment C.

1.4 Settling Defendant Roles

The SDs are jointly submitting this Discharge Pilot Project Work Plan. To allow sufficient time for the project to be used to support and supplement the final BMFOU remedy, the Discharge Pilot Project must begin to pump, treat, and discharge water in the first half of 2019. The SDs will take the following lead roles to ensure timely implementation of this Work Plan:

- **On-site Water Management System:** MR will take the lead role for the on-site water management components that are integral to operating the Discharge Pilot Project.
- **Discharge System:** Atlantic Richfield will take the lead role for implementing the Discharge System, including water polishing and treatment activities necessary to discharge water to Silver Bow Creek in compliance with the BMFOU CD (EPA, 2002) Discharge Standards.

The major components of the on-site water management system, the Discharge System, and anticipated flows, are represented on Figure 1.

MR and Atlantic Richfield may each submit documents to the Agencies relevant to their respective roles individually, and these will be submitted on behalf of all the SDs.

2.0 DISCHARGE PILOT PROJECT OBJECTIVES

The Discharge Pilot Project is intended to support and supplement the RAAR by developing more information regarding remedy management and optimization. Consistent with the objectives presented by the SDs in the January 25, 2018, correspondence and subsequent Agency concurrence to proceed provided in their February 27, 2018, correspondence, the Discharge Pilot Project will evaluate the following objectives:

1. ***“Berkeley Pit Inflow Control*** – *The Discharge Pilot Project will evaluate the effectiveness of controlling the Berkeley Pit water level rise by removal of water directly from the Pit.*
2. ***Points of Compliance (POCs) Connectivity*** – *The Discharge Pilot Project will evaluate the hydraulic connectivity of the Berkeley Pit to the outlying POCs by monitoring the impact of the Discharge Pilot Project on slowing, or stopping, the rise of groundwater in the outlying POCs.*
3. ***Off-Site Discharge*** – *The Discharge Pilot Project will test different off-site discharge scenarios using existing, new, and temporary discharge infrastructure over a period of 2-4 years, treating varying water flow rates and qualities, and discharging during varying seasonal fluctuations of the receiving water.*

4. **Horseshoe Bend Water Treatment Plant (HsBWTP) Optimization** – *The Discharge Pilot Project will evaluate the ability of the HsBWTP to treat Berkeley Pit water (after being routed through MR's precipitation plant for copper recovery)¹.*
5. **Yankee Doodle Tailings Impoundment (YDTI) Treatment** – *The Discharge Pilot Project will update information previously learned from 1996 to 2000 concerning the capability of the supernatant pond at YDTI to act as a component of the remedy to directly treat the Horseshoe Bend water.*
6. **Incorporation of Treated Berkeley Pit Water into the Active Mining Operation** – *The Discharge Pilot Project will test the feasibility of passing treated water from the Berkeley Pit to MR's mill and ultimately to YDTI, similar to what is currently happening with treated HsB water. "This will test the ability of the active mining operation to accept treated water into the future, potentially minimizing off-site discharge requirements while holding the water level in the Berkeley Pit steady.*
7. **Active Mine Water Reduction Effort** – *Consistent with the recommendation of the YDTI Engineer of Record, MR is currently reducing the volume of water stored in the YDTI to the minimum amount needed for efficient mining operations. It is presently estimated that the minimum amount of stored water in the YDTI for efficient mining operations is approximately 15,000 acre-feet. The Discharge Pilot Project would accelerate the water volume reduction by treating and discharging approximately 7 MGD (million gallons per day) over the next few years. Once the YDTI target storage volume is reached (15,000 acre-feet), the results of the Discharge Pilot Project will be used to evaluate the ability of the mining operations to accept additional treated water without discharge from the site."*

3.0 DISCHARGE PILOT PROJECT WORK PLAN COMPONENTS

This Work Plan summarizes the major work components of the Discharge Pilot Project and how these components will be used to evaluate the objectives listed above and support and supplement the final RAAR remedy to inform RAAR management optimization. This Work Plan is organized to correspond with the objectives listed previously. Corresponding detailed work plans are included as separate attachments and organized per the roles defined for the SDs in Section 1.4 (i.e., on-site water management system and discharge system). The following subsections summarize work that will be completed to execute the Discharge Pilot Project.

3.1 Berkeley Pit Inflow Controls

The BMFOU remedy requires the SDs to maintain the Berkeley Pit at a surface water level below the CWL. During the Discharge Pilot Project, the Berkeley Pit Pumping System, which is considered part of the on-site water management components (Attachment A), will be constructed and used to remove water from the Berkeley Pit at a rate expected to meet the presumed net infilling rate. This will allow the SDs to evaluate the impacts of pumping from the Berkeley Pit. The Berkeley Pit Pumping System will consist of the following key infrastructure items:

¹ Routing through MR's precipitation plant for copper recovery may not continue for the full duration of the Pilot Project and will depend on economic viability.

- Floating Barge – A vertical pump, mounted on the floating barge, will deliver Berkeley Pit water to the Berkeley Pit Pump House through an 18-inch high density polyethylene (HDPE) pipeline.
- Berkeley Pit Pump House – A horizontal pump will be used to boost and convey the Berkeley Pit water to the Precipitation Plant area through an 18-inch HDPE pipeline.

3.2 POC Connectivity

The SDs will evaluate the ability of the Berkeley Pit Pumping System to control the groundwater elevation in the East Camp POCs. Pumping from the Berkeley Pit is anticipated to result in a commensurate response in the underground workings that are connected to the Berkeley Pit. However, this assumption has not been tested. The SDs intend to test this assumption with the Discharge Pilot Project to identify operational targets for maintaining the groundwater levels in the POCs below the CWL. The SDs will use the existing POC monitoring network to evaluate the East Camp POC connectivity, and do not anticipate any additional infrastructure at this time for this objective.

3.3 Off-Site Discharge

As part of the Discharge Pilot Project, the SDs will design and build a Discharge System to test a variety of treatment options for discharging of water off the site. The Discharge System will be designed, constructed, and operated to meet the BMFOU CD (EPA, 2002) Discharge Standards under a variety of scenarios. A detailed description of the Discharge System is included in Attachment B and summarized as follows:

- **Discharge System Infrastructure:** The Discharge System will consist of the following key infrastructure and equipment (major elements of the Discharge System are shown on Figures 2 and 3):
 - Polishing Facility – The Polishing Facility will consist of a newly constructed water treatment facility located just south of the Berkeley Pit. The Polishing Facility will house the multimedia filtration and Reverse Osmosis (RO) infrastructure. The Polishing Facility design will allow a variety of combinations of multi-media filtration and RO to be pilot tested. The Discharge System design allows for an average off-site discharge capacity of 7 MGD and maximum off-site discharge capacity of up to 9.5 MGD. The Polishing Facility is being constructed with 3.0 MGD of RO capacity, and the RO infrastructure is anticipated to be operational within 1 year from the date the Discharge Pilot Project begins discharging treated water to Silver Bow Creek.
 - Polishing Facility Influent Line – The Influent Line will be a newly constructed HDPE line conveying YDTI Return Water from the Return Water line to the Polishing Facility. The Influent Line will tie into the Return Water line near the McQueen Booster Station as shown on Figure 2.
 - RO Reject Line – The RO Reject Line will be a newly constructed HDPE pipeline conveying RO brine waste (RO reject water) from the Polishing Facility to the Berkeley Pit as shown on Figure 3.

- Offspec/Backwash Line – The Offspec/Backwash Line will be a newly constructed HDPE pipeline conveying offspec and filter backwash water from the Polishing Facility to the MR Dredge Pond.
 - On-site Effluent Line – The On-site Effluent Line will be a newly constructed HDPE pipeline conveying treated water from the Polishing Facility to the existing Horseshoe Bend Effluent Line (HBEL) as shown on Figure 3.
 - HBEL – The HBEL is an existing underground HDPE pipeline that was designed to convey treated water off the site to be discharged at the confluence of Blacktail and Silver Bow Creeks.
 - Flow Augmentation Mixing – Flow augmentation mixing will consist of a newly constructed system to mix Silver Lake water with treated water from the Polishing Facility where the On-site Effluent Line ties into the HBEL.
- **Shakedown Period:** Consistent with Agency correspondence dated August 24, 2018, the Discharge Pilot Project will include a 1-year shakedown period starting upon initial discharge of treated water to Silver Bow Creek. During the shakedown period, the interim BMFOU CD Discharge Standards will apply to the discharge.
 - **Flow Augmentation:** Consistent with the Agency correspondence dated August 24, 2018, the Discharge System will use up to 7 MGD of Silver Lake water for effluent flow augmentation during the one year Shakedown Period that begins when treated water is discharged to Silver Bow Creek (and for a longer period of time if extended by the Agencies). Effluent flow augmentation will be evaluated as described in Section 4.2. The SDs will also construct the Polishing Facility RO infrastructure and test it as an active treatment method to achieve compliance with chronic WET standards.
 - **Receiving Water Flow:** Compliance with the chronic WET standards for Silver Bow Creek will be achieved after complete mixing of treated water with the receiving water flows into the creek, as specified in the BMFOU CD (EPA, 2002). Receiving Water Flow will include all flow within Blacktail Creek at SS-04 U.S. Geological Survey (USGS) monitoring station plus any Silver Lake water added (if any).
 - **Flow Proportioning:** The Discharge System will use varying rates of treated water discharge (up to 9.5 MGD) in proportionate to receiving water flow rates to maintain chronic WET compliance as required by the BMFOU CD (EPA, 2002) Discharge Standards. The ratio of effluent flow to receiving water flow necessary to pass the chronic WET test will be established through testing.
 - **Discharge Standards:** The Discharge System will comply with the BMFOU CD (EPA, 2002) Discharge Standards described in *Exhibit 3, Section I.C. Point Source Water Discharges and Section II.C Surface Water Standards – Ambient and Point Source Discharges of the 2002 Consent Decree for the Butte Mine Flooding Site* (BMFOU CD Discharge Standards) and listed in Table 1 below. Consistent with Agency correspondence dated August 24, 2018, interim BMFOU CD Discharge Standards will apply during the 1-year Shakedown Period and final BMFOU CD Discharge Standards will apply at the conclusion of the Shakedown Period for the remainder of the Discharge Pilot Project.

Table 1. BMFOU CD Interim and Final Discharge Standards

Parameter (Total Recoverable Metals)	Units	Interim BMFOU CD Discharge Standards		Final BMFOU CD Discharge Standards	
		Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.
Arsenic ¹	µg/L	10	10	10	10
Cadmium ^{1,2,3}	µg/L	11 ²	22 ²	0.8 ³	5 ¹
Copper ⁴	µg/L	30.5	51.6	30.5	51.6
Iron ⁵	µg/L	1,000	1,500	1,000	1,500
Lead ¹	µg/L	15	15	15	15
Mercury ⁵	µg/L	0.91	1.7	0.91	1.7
Zinc ⁴	µg/L	388	388	388	388
pH	S.U.	6.5 to 9.5	6.5 to 9.5	6.5 to 9.5	6.5 to 9.5
TSS	mg/L	20	30	20	30
Uranium ^{1,6}	µg/L	--	--	30	30
Combined Radon 226/228 ^{1,6}	pCi/L	--	--	5	5
Gross Alpha particle ^{1,6}	pCi/L	--	--	15	15
Beta/photon Emitters ^{1,6}	mrem/yr	--	--	4	4
Acute, end of pipe (100% effluent)		--	Pass	--	Pass
Chronic, instream (following complete mixing of the effluent stream and Silver Bow Creek flows)		--	Pass	--	Pass

¹ Human health standards from Montana Department of Environmental Quality, Circular DEQ-7, Montana Numeric Water Quality Standards (DEQ-7) (DEQ, 2017) or federal drinking water standards.

² The interim standards for cadmium are derived from pilot studies and represent a maximum monthly average and daily concentration limit that may occur during shakedown operations as experience is gained with operation of the treatment system.

³ The chronic, final standard for cadmium is hardness dependent. The limitation is based on DEQ-7 numeric standards assuming a hardness of 400 mg/L. Hardness shall be measured in the discharge and the limitation shall be adjusted for each sample.

⁴ The standards for copper and zinc are hardness dependent. These limitations are based on DEQ-7 numeric standards assuming a hardness of 400 mg/L. Hardness shall be measured in the discharge and the limitations shall be adjusted for each sample.

⁵ Acute or Chronic aquatic life standards from DEQ-7.

⁶ No interim standard. Data shall be collected, and actions implemented, to assess compliance with the final Discharge Standards.

µg/L: micrograms per Liter. S.U.: standard units. mg/L: milligrams per Liter. pCi/L: picoCuries per liter. mrem/yr: millirems per year.

- **Discharge Demonstration Period:** The Discharge Pilot Project will include a demonstration period to verify the Discharge System can consistently meet the BMFOU CD (EPA, 2002) Discharge Standards prior to discharging off site to Silver Bow Creek. The discharge demonstration period is the post-commissioning period that begins when a new element (e.g., single stage filtration, dual stage filtration, RO system, etc.) of the Discharge

System begins operation, and continues until work is completed to verify that with the addition of the new element the Discharge System can consistently meet the BMFOU CD Discharge Standards before treated water is discharged to Silver Bow Creek. Depending on how the Discharge System is commissioned, there may be several differing discharge demonstration periods to verify the new elements of the Discharge System as they are added to the system. During a discharge demonstration period, treated water will be directed to the Berkeley Pit or the MR mining circuit and monitored to verify that the effluent meets the BMFOU CD Discharge Standards. As part of the discharge demonstration period(s), it is anticipated the Discharge System influent flow rate, multimedia filtration, RO, and effluent flow augmentation will be varied to simulate the full range of operating conditions. Under all operating conditions, the Discharge System must achieve BMFOU CD Discharge Standards. If any of the Discharge Standards cannot be met, the cause(s) of the deficiencies will be identified and corrected. The discharge demonstration period will be operated until the following criteria are met:

1. Treated water from the Discharge System meets all total recoverable metals BMFOU CD Discharge Standards.
 2. Acute and chronic WET tests are completed and demonstrate compliance with all acute and chronic WET BMFOU CD final Discharge Standards. (Note: The initial demonstration period WET test may consist of WET testing completed on raw YDTI water to show that the water to be treated already meets WET test criteria and expedite the initial demonstration period.)
 3. SDs submit a report to the Agencies that documents compliance with the above criteria.
- **Reject Water:** Any RO brine stream from the Polishing Facility (reject water) will be routed to the Berkeley Pit as shown on Figure 3. The SDs intend to pump an appropriate volume out of the Berkeley Pit to offset the RO brine waste and any other water that flows into the Pit, control water levels in the Pit, and maintain an estimated monthly average net increase of 0 MGD in the Berkeley Pit.
 - **Offspec/Backwash:** Any filter backflush and water treated by the Discharge System that does not meet the BMFOU CD (EPA, 2002) Discharge Standards will be routed to the MR mining circuit via the Dredge Pond, or to the Berkeley Pit via overflow from the Dredge Pond as shown on Figure 3. In the event the flow is routed to the Berkeley Pit, it is the SD's intent to offset this flow by pumping water out of the Berkeley Pit, to maintain an annual net increase of 0 MGD inflow into the Berkeley Pit.

3.4 HsBWTP Optimization

The HsBWTP was originally designed to include treatment of Berkeley Pit waters, although it has not been used for this purpose yet. It is the intent of the SDs to test the ability of the HsBWTP to treat the Berkeley Pit water. At this time, no additional infrastructure is currently planned to be constructed to support this objective.

3.5 YDTI Treatment

To further evaluate the efficiencies of using the YDTI as part of the treatment process, the HsB seep flows will be re-routed and conveyed to the YDTI through a new pumping and piping system (HsB Capture System). The HsB area flows will be mixed with lime-infused tailings slurry (“supercharged tailings”); this is similar to the practice that was employed from 1996 to 2000. The HsB area flows and supercharged tailings mixture will then be discharged to the impoundment where metals will be allowed the opportunity to precipitate out in the tailings mass with the provided residence time. With respect to the RAAR, the SDs will evaluate whether this on-site water management change could be used as an optional component of the BMFOU remedy to treat HsB water. Details of the HsB Capture System are included in Attachment A, and will consist of the following key infrastructure items:

- HsBWTP Influent Pump House – One of the 2 vertical pumps located in the HsBWTP Influent Pump House will be modified to pump water from the wet well to a new pump house (HsB Capture System Pump House). The HsBWTP existing equalization basin will be maintained, thus providing the water to be conveyed in the HsB Capture System.
- HsB Capture System Pump House – A new pump house equipped with 2 pumps, will convey water from near the HsBWTP equalization basin up the 7% haul road to the new booster pump house (HsB Capture System Booster Station).
- HsB Capture System Booster Pump House - A new pump house (booster station), with identical equipment to the HsB Capture System Pump House, will convey water to the existing tailings lines near Number 3 Booster Station where it will be mixed with supercharged tailings.
- Supercharged Tailings - Idle lime management infrastructure will be refurbished and upgraded to accommodate the additional lime demand associated with the HsB Capture System. Additional lime will be added into 2 of 3 existing tailings sumps, with automated valves directing the lime flow to whichever 2 sumps are running at the time (and the lime mixing with the existing tailings streams in the sumps). The existing tailings infrastructure will pump the supercharged tailings to a location near the Number 3 Booster Station where the main mixing of HsB water and supercharged tailings will occur.

3.6 Incorporating Treated Berkeley Pit Water into the Active Mining Operation

Historically, the active mine process water circuit has been used for the treatment of BMFOU waters, first by directly incorporating HsB area flows into the tailings facility (1996 to 2000) and later by incorporating treated HsB area flows from the HsBWTP into the Return Water line to the mill and then transport them to the tailings facility with the mill tailings (2004 to present). This Discharge Pilot Project will evaluate using both methods of incorporating BMFOU waters into the active mine process water circuit and in greater amounts (i.e., approximately 3 MGD of Berkeley Pit water along with the HsB area flows). The Discharge Pilot Project will test the ability of the YDTI to continue to provide polishing treatment through extended retention of BMFOU water, while at the same time not accumulating constituents such as calcium and sulfate

at concentrations that would negatively affect the milling process. Ultimately the results of the Discharge Pilot Project should be able to supplement the RAAR findings and determine how much, if any, treated Berkeley Pit water could be incorporated into mining operations as part of the BMFOU remedy during active mining. No additional infrastructure is currently planned to be constructed to support this objective.

3.7 Active Mine Water Reduction Effort

The YDTI Engineer of Record (EoR) has recommended that MR continue to look for opportunities to reduce the inventory of water stored within the YDTI. The Discharge Pilot Project provides a coincidental opportunity to further reduce inventoried water. No additional infrastructure is currently planned to be constructed to support this objective.

4.0 DISCHARGE PILOT PROJECT MONITORING AND EVALUATION PROGRAM

The Discharge Pilot Project monitoring and evaluation program will be structured as described in the following sections to facilitate the evaluation of the Discharge Pilot Project and systematically determine if the Discharge Pilot Project meets the objectives described in Section 2.0.

A Quality Assurance Project Plan (QAPP) (Arcadis, 2018a) and Sampling and Analysis Plan (SAP) (Arcadis, 2018b) for the BMFOU were developed, and the Montana Bureau of Mines and Geology (MBMG) is developing a QAPP and SAP for the East Camp groundwater elevations. These documents will be used as applicable for the Discharge Pilot Project.

Pursuant to standard Agency practice, a Data Quality Objectives summary table has been prepared and is included as Attachment D. The following subsections provide a discussion of how the key components of the Discharge Pilot Project will be monitored to meet the objectives identified in Section 2.0.

4.1 Berkeley Pit Inflow Control

The Berkeley Pit inflow control evaluation objective includes:

- Identifying the required pumping rate in the Berkeley Pit to control the water level (i.e., stop the rise) and maintain a net infilling rate near 0 MGD.

The following will be monitored to evaluate the objective:

- Berkeley Pit Pumping System: A continuous flow monitor will be installed to measure flow rates being pumped from the Berkeley Pit.
- Discharge Facility Reject Line: The Reject Line conveying reject water from the Polishing Facility to the Berkeley Pit will be monitored in real time.

- Discharge Facility Offspec/Backwash Line: The Offspec/Backwash Line conveying offspec and backwash water from the Polishing Facility to the mining circuit (or Berkeley Pit via the Dredge Pond overflow) will be monitored in real time. Offspec/backwash flows to the Berkeley Pit will be minimized by incorporating the water into the mining circuit, as well as reducing influent flows to the Polishing Facility as needed. If an overflow to the Berkeley Pit occurs, a conservative volume estimate will be developed using an allocated real-time flow measurement of the Offspec/Backwash Line and associated overflow time.
- The BMFOU CD-required Berkeley Pit monthly water level elevation survey will continue.

4.2 POC Connectivity

The SDs will monitor the East Camp POC water levels for changes associated with pumping from the Berkeley Pit. The monitoring will continue for the duration of the Discharge Pilot Project to substantiate that the water levels stabilize with continued pumping from the Berkeley Pit. The East Camp groundwater evaluation objectives include:

- Identify the impacts of pumping from the Berkeley Pit on water levels in the East Camp POCs.
- Identify the required pumping rate in Berkeley Pit to control (i.e., stop the rise) groundwater in the POCs to be used to support and supplement the final BMFOU remedy.

The East Camp evaluation will include:

- Review of the existing BMFOU CD monitoring network managed by the MBMG for monitoring the response in water levels and water quality in the East Camp POCs from the Discharge Pilot Project. The monitoring network is currently instrumented with transducers recording temperature and water levels at hourly intervals. The transducers are downloaded monthly and the data documented in a monthly report.

4.3 Off-Site Discharge

The SDs will implement a monitoring and evaluation program to evaluate the Discharge System and off-site discharge of treated water. The off-site discharge evaluation objectives include:

- Identify the ability of the Discharge System to meet the BMFOU CD Discharge Standards (EPA, 2002), as described in Attachment B. If the Discharge System maintains compliance with the BMFOU CD Discharge Standards, then the objective is met.
- Evaluate the feasibility of multimedia filtration and RO in the final remedy as described in Attachment B. If significant maintenance is required for the Discharge System to treat and discharge water off the site, then another treatment technology may be evaluated for the final remedy design.

- Evaluate the potential for scaling in the Discharge System effluent piping and Silver Bow Creek. If scale is observed within the receiving stream or scale continually is deposited on the discharge piping, then the treatment process is not adequate for the final remedy design.
- Monitor and evaluate the Discharge Pilot Project effects on the downstream OUs.
- Evaluate polishing treatment as a way to ensure reliable cadmium compliance (from 2011 Five-Year Review).
- Additional performance testing to evaluate supersaturation of gypsum and scaling in the polishing plant and effluent to Silver Bow Creek (from 2011 Five-Year Review).
- Perform WET testing on effluent representative of current influent water quality and operating conditions (from 2011 Five-Year Review).

An addendum to the BMFOU SAP (Arcadis, 2018b) with information related to the Discharge System is included within Attachment B.1 and addresses specifics associated with the Discharge Pilot Project not otherwise addressed in the BMFOU SAP. The addendum includes the following as related specifically to the Discharge Pilot Project:

1. Sampling locations and frequencies.
2. Field measurements.
3. Sample collection and analysis procedures.
4. Data Quality Objectives.
5. Quality assurance/quality control (QA/QC) sample requirements.

Additionally, an Operations Assurance Plan (OAP) is provided in Attachment B.1 that identifies the methodology for assessing compliance with surface water performance standards in point-source discharge released from BMFOU into Silver Bow Creek (receiving water). Methods described within the OAP are pursuant to monitoring, compliance, and reporting requirements for point-source discharge set forth in Appendix C: Statement of Work to the BMFOU CD (EPA, 2002).

4.4 HsBWTP Optimization

The HsBWTP evaluation objectives include:

- Evaluate the ability of the existing HsBWTP infrastructure to treat Berkeley Pit water.
- Additional performance testing to evaluate treating Berkeley Pit water (from 2011 Five-Year Review).

Consistent with ongoing RAAR HsBWTP optimization efforts, the current HsBWTP monitoring and evaluation will be continued to evaluate HsBWTP optimization.

4.5 YDTI Treatment

The SDs will implement a monitoring and evaluation program to evaluate the treatment ability of the YDTI. The YDTI treatment evaluation objectives include:

- Assess water treatment capacity of the YDTI. The Discharge Pilot Project will assess the capability of the supernatant pond to act as a component of the remedy. The Discharge Pilot Project will evaluate if the water quality, as measured in the feed to the Polishing Facility, maintains gypsum at or below saturation limits and maintains constituents of concern at levels that can be treated by the Polishing Facility to meet the BMFOU CD Discharge Standards (EPA, 2002).

The following flows will be monitored to evaluate this objective:

- HsB Capture System to YDTI: A continuous flow monitoring location will be installed to monitor the HsB Seeps water being pumped to the mining circuit via the YDTI.
- Return Water line: The existing monitoring methods and location will be continued.

4.6 Incorporating Treated Berkeley Pit Water into the Active Mining Operation

The incorporation of treated Berkeley Pit water into the active mining operation evaluation objectives include:

- Test the ability of the active mining operation to accept more treated BMFOU water into the future, potentially minimizing or eliminating the need for treated water to be discharged off the site, while controlling the water level in the Berkeley Pit to keep it below the CWL.
- Identify impacts of incorporating the treated Berkeley Pit water into the active mine circuit.
- Determine if incorporation of Berkeley Pit water into the active mine circuit is detrimental to the active mine operations.

No new on-site water quality locations will be monitored to evaluate this objective beyond existing monitoring and monitoring identified in other components of this Work Plan.

4.7 Active Mine Water Reduction Effort

The YDTI EoR has recommended that MR continue to look for opportunities to reduce inventory of water stored within the YDTI. This objective will not be evaluated per this Work Plan. Monitoring this objective will be consistent with MR's Mine Operating Permits and recommendations from the YDTI EoR.

5.0 DISCHARGE PILOT PROJECT SCHEDULE

The Discharge Pilot Project will be temporary, and the SDs anticipate that it will continue over a period of three to five years. This section describes the Discharge Pilot Project schedule and anticipated impacts on the BMFOU CD schedule.

5.1 Anticipated Schedule

The SDs anticipate the following Discharge Pilot Project schedule:

- Construction – August 2018 through May 2019.
- Filtration Start-up/Commissioning – First half 2019.
- Filtration Discharge Demonstration Period – First half 2019.
- RO Start-Up/Commissioning – by May 2020.
- RO Discharge Demonstration Period – by May 2020.
- Operations – April/May 2019+.

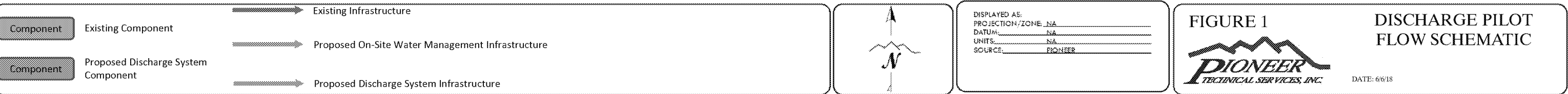
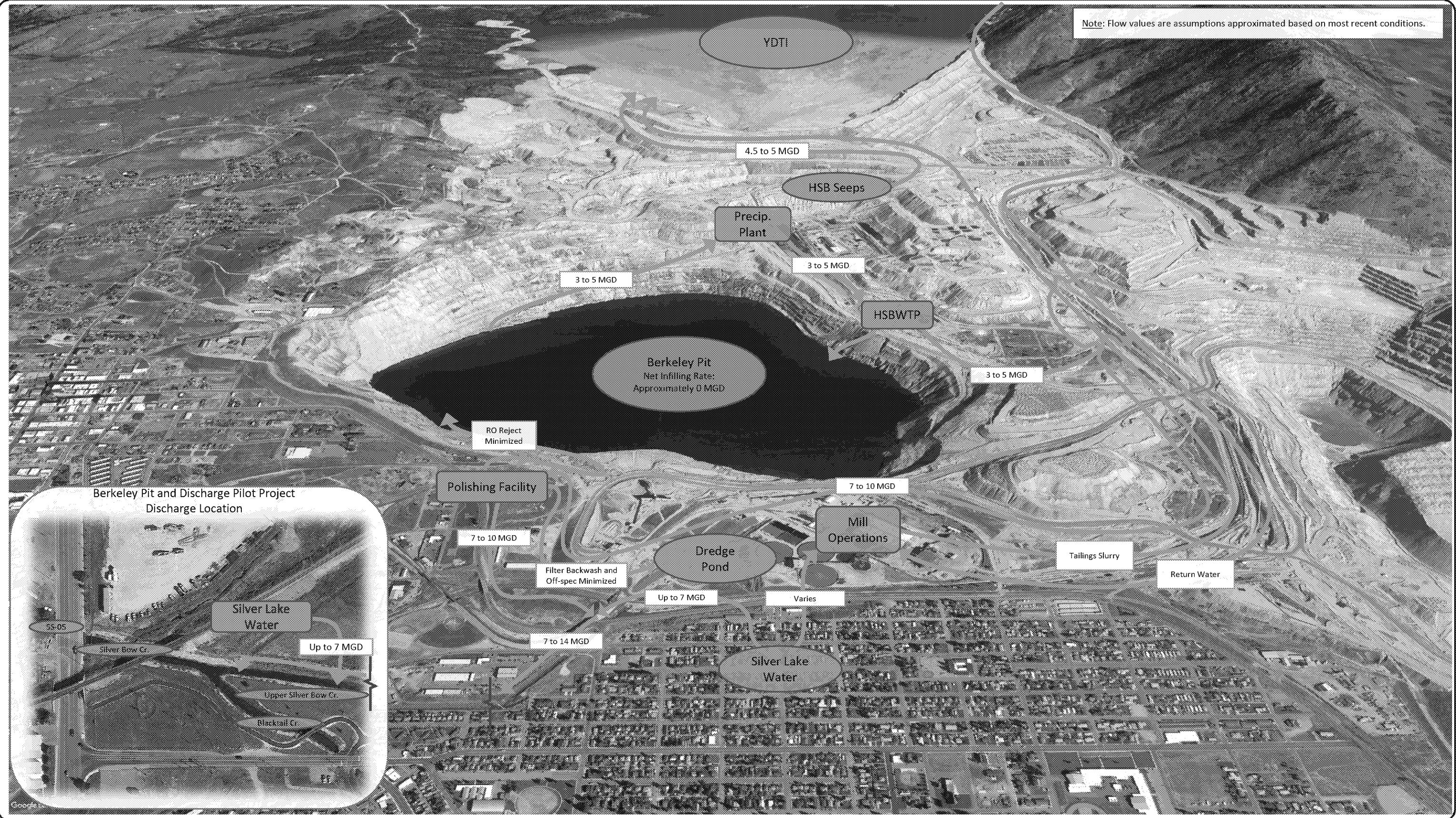
5.2 Impacts to BMFOU CD Schedule

Impacts of the Discharge Pilot Project on the BMFOU CD schedule will not be determined until the Discharge Pilot Project has been operated for a period of time to provide sufficient operational data. The SDs anticipate that preliminary conclusions on the ability of the Discharge Pilot Project to meet many of the objectives will be available within two to six months of operation. These preliminary conclusions will be used to support and supplement the RAAR remedy. While the RAAR schedule will continue as currently projected by the MBMG model, as information develops from the Discharge Pilot Project, it will be used to supplement the RAAR and further inform decisions regarding the design and operation of the final BMFOU remedy in the future.

6.0 REFERENCES

- Arcadis, 2018a. Silver Bow Creek/Butte Area NPL Site, Butte Mine Flooding Operable Unit, Quality Assurance Plan. October 28, 2018.
- Arcadis, 2018b. Silver Bow Creek/Butte Area NPL Site, Butte Mine Flooding Operable Unit, Sampling and Analysis Plan. August 29, 2018.
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- DEQ, 2017. Water Quality Division, Water Quality Planning Bureau, Water Quality Standards and Modeling Section. 2017. DEQ-7 Montana Numeric Water Quality Standards. Helena, Montana. Montana Department of Environmental Quality, May 2017.
- EPA, 2002. U.S. Environmental Protection Agency Silver Bow Creek/Butte Area NPL Site, Butte Mine Flooding Operable Unit, Consent Decree. March 2002.
- EPA, 1994. U.S. Environmental Protection Agency Silver Bow Creek/Butte Area NPL Site, Butte Mine Flooding Operable Unit, Record of Decision. September 24, 1994.

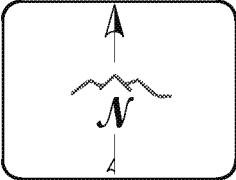
Figures





LEGEND	
MR PROPERTY BOUNDARY	EXISTING INFRASTRUCTURE
PARROT TAILINGS DEWATERING LINE	YDTI RETURN LINE
PLANNED PARROT TAILINGS ACTION AREA	HORSESHOE BEND EFFLUENT LINE (HBEL)
POLISHING FACILITY CONSTRUCTION LIMITS	SILVER LAKE WATERLINE
	BELMONT STORM DRAIN
PROPOSED INFRASTRUCTURE	
ONSITE EFFLUENT LINE	POLISHING FACILITY INFLUENT LINE
BACKWASH/OFF-SPEC TO EMERGENCY/DREDGE POND	REJECT LINE
SILVER LAKE WATERLINE EXTENSION	

NOTE:
1. PIPELINE ALIGNMENTS SHOWN ARE APPROXIMATE.



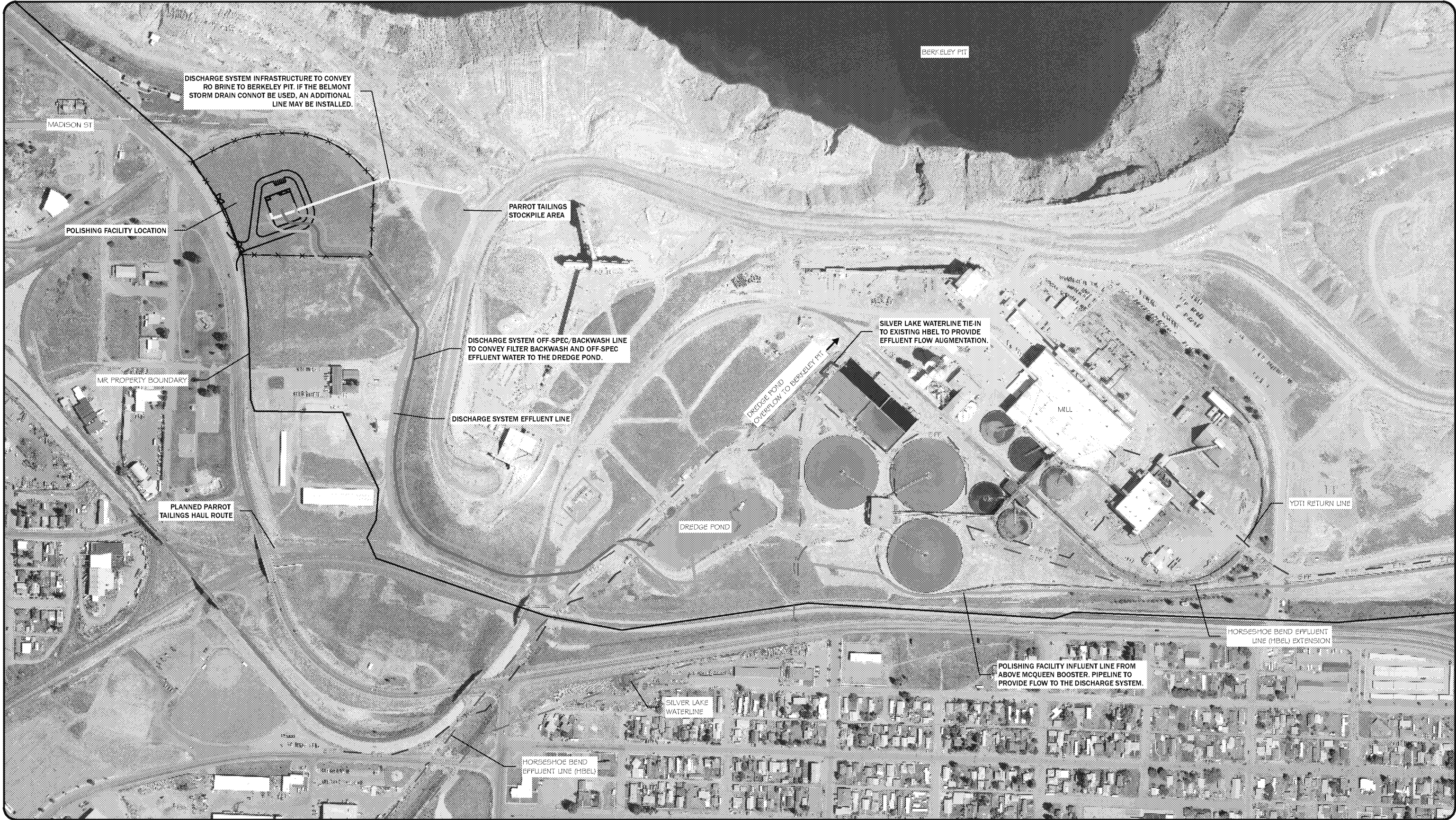
DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT. FEET
SOURCE: PIONEER

0 500 1,000 2,000
Feet

FIGURE 2

DISCHARGE SYSTEM INFRASTRUCTURE OVERVIEW

DATE: 2/7/2019



LEGEND		EXISTING INFRASTRUCTURE	PROPOSED DISCHARGE SYSTEM PIPELINES	NOTE: 1. PIPELINE ALIGNMENTS SHOWN ARE APPROXIMATE.
	MR PROPERTY BOUNDARY		YDTI RETURN LINE	
	PARROT TAILINGS DEWATERING LINE		HORSESHOE BEND EFFLUENT LINE (HBEL)	
	FENCE		SILVER LAKE WATERLINE	
	PLANNED PARROT TAILINGS ACTION AREA		BELMONT STORM DRAIN	
	POLISHING FACILITY CONSTRUCTION LIMITS			
				ONSITE EFFLUENT LINE
				POLISHING FACILITY INFLUENT LINE
				BACKWASH/OFF-SPEC TO EMERGENCY/DREDGE POND
				REJECT LINE
				SILVER LAKE WATERLINE EXTENSION

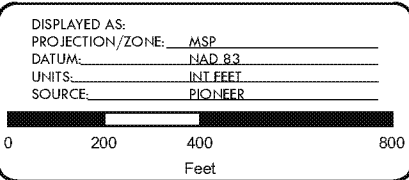
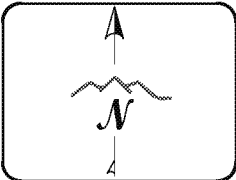


FIGURE 3

DATE: 2/5/2019

DISCHARGE SYSTEM
PIPELINE
SUMMARY